

NILSON

L. T. CONTROL CABLES



ABOUT OURSELVES

CABLE plays a very important role in our day-to-day life. It is not merely a piece of insulated wire connecting various areas of our day-to-day life, but also an integral part of the increasing world of automation. Dependence on right type of cable has become a constructional feature.

Anandji Cables solved the complex problems with the experience gained over a number of years. Anandji cables products are developed with the aid of the most up-to date production and testing systems and are now oriented to meet specific customer demands, involving stringent procedures and parameters mandated under ISO-9000 and other international codes.

Our reputation has been built our high quality products. Fine copper wire strands is an important factor for the production of highly flexible LT cables, and our laying up technique with reverse twisting improves working performance. Our twisting technique affords increased durability, longer life and lower production cost. Nilson cable's insulation / sheathing compound maintains these requirements over a broad temperature range and ensures high mechanical resistance. Special design gives the cable protection against external mechanical and natural influences, so it is more resistant to hot swarf or the destructive effects of impact and abrasion. This is because it is the established fact that mechanical and chemical influences are the cable's major enemies. Oils, benzine, acids, alkalis and other chemical agents just as hard on the cable sheath as heat, cold and other natural effects, or the interaction of both. The result of this is the Anandji Cable's range of 'NILSON' brand special LT cables.

Manufactured by

Anandji Cables

7, Moon Light Shopping Centre, M. V. Road, Andheri (E), Mumbai-400 069. • Phone : 832 24 46/832 69 86 • Fax : 91-22-821 21 72

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Anandji Cables 'Nilson' brand high quality LT cables can be used in a wide range of applications. We manufacture a variety of cables which include number of colour-coded multicore, flat forms with integrated support wires, fine wire cables for the electronic and data processing industries screened standard and special cables; shielded cables with drawn core. Nilson Cable's sheaths carry print marks of the no. of cores, sizes, description of the core, etc.

This has become possible because Anandji Cables 'Nilson' brand LT cables have also been granted ISI marks by the Bureau of Indian Standards. The most appropriate and modern production equipments are used including quality tested material for the manufacture and processing of Anandji Cables 'Nilson' brand LT cables.

Anandji Cables is constantly developing new products all of which undergo harsh practical and fatigue testing to enable, achieve and maintain the high standards to customer's requirements.

It is the Cable which connects the present with the future. That is why we want to introduce ourselves to you TODAY as your partner in solving TOMORROW'S problems.

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PRODUCT APPLICATION & MATERIALS

PRODUCT APPLICATIONS :

The fields of applications for cables are as varied as demands made upon their electrical, mechanical & thermal qualities. "NILSON" high quality L.T. Control Cables can be used in a wide range of applications.

- Power station distribution systems.
- Utility networks.

- Railway Signalling.
- Cement Industries.
- Petrochemical Plants.
- Steel Plants.
- House Service connections & Industrial Installations.
- Generating Stations & sub-stations.
- Machine.

Suitable for use in Indoor or Outdoor installations, wall mounted or in cable ducts.

To meet individual needs our cable technicians and application engineers will provide the information and assistance you require. We have developed 'Nilson' L. T. Control Cables in conjunction with each specialised area of application.

MATERIALS :

COMPONENT	MATERIAL
Conductors	Plain Bare / Tinned Copper as Specified.
	Size :- 1.5 sq.mm 2.5 sq.mm 4.0 sq.mm 6.0 sq.mm
	Solid :- 1/1.40 1/1.80 1/2.24 1/2.80
	Stranded :- 7/0.52 7/0.67 7/0.85 7/1.04
Insulation	Polyvinyl chloride (PVC) 70 ⁰ C Flame Retardent.
	Type Application Max. Cond. Temp.
	A Insulation 70 ⁰ C
	C Insulation 85 ⁰ C
	ST ₁ Sheath 70 ⁰ C
ST ₂ Sheath 70 ⁰ C & 85 ⁰ C	
Inner Sheath (Bedding)	PVC Black 70 ⁰ C Flame Retardent.
Armour – As required.	Galvanized Steel Wire / Strip. Round steel wires are used where the diameter over the inner sheath does not exceed 13 mm. Above flat steel strips armouring is provided.
Outer Sheath Jacket	PVC Black 70 ⁰ C Flame Retardent or specified colour.

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CONSTRUCTION & ASSEMBLY SPECIFICATIONS & STANDARDS

Core identification	<p>For power cables & control cables upto 5 cores, the cores are Identified by different colours, as per IS - 1554.</p> <p>Single Core :- Red, Black, Yellow or Blue Two Core :- Red, Black Three Core :- Red, Yellow & Blue Four Core :- Red, Yellow, Blue & Black Five Core :- Red, Yellow, Blue, Black & Grey.</p>
	<p>Identification for Cables having more than 5 Cores;</p> <p>Where the No. of cores exceed 5, two adjacent cores are blue for reference & yellow for direction in each layer. The remaining cores in each layer are Grey. On specific request we can also provide core numbering for control cables.</p>
Cable core	<p>Cable Core : The cable core is formed by assembling the required number of elements, which are laid concentric layers as necessary.</p>
Sheath	<p>The Laid core is sheathed with black PVC or Specified colour.</p>
Armour (SWA)	<p>A further protective covering can be provided by the application of Galvanised steel wires/strips & a Black PVC oversheath, OR Specified Colour.</p>
Cable Code	<p>The following code is used for easy identification</p> <ol style="list-style-type: none">1. A : Aluminium conductor2. Y : PVC insulation3. W : Steel round wire armour4. F : Steel strip armour5. YY : PVC insulated & PVC sheathed6. WW : Steel double round wire armour7. FF : Steel double strip armour8. Y : PVC outer sheath

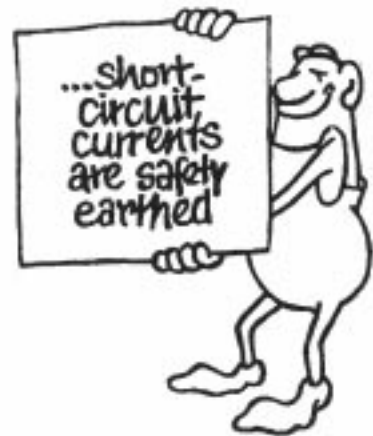
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SELECTION OF CABLE :

The following points should be taken into consideration before selecting any particular size & type of cable.

- The system of power & voltage source where the cables are being used.
- Conditions of installation at site.
- Current carrying capacity of cable.
- Voltage drop of the cable.
- Short circuit capacity of cable.
- Availability of the selected size of cable.

SHORT CIRCUIT RATING IN K. Amp. For One Second Duration.

Area of conductor Sq. mm.	Copper Conductor	
	G. P. PVC	H. R. PVC
1.50 sq. mm.	0.169	0.153
2.50 sq. mm.	0.283	0.255
4.00 sq. mm.	0.452	0.406
6.00 sq. mm.	0.679	0.612

FORMULA FOR CALCULATING SHORT CIRCUIT

$$I_t = \frac{I_1}{\sqrt{t}} \quad \text{Where } \begin{array}{l} I_1 = \text{Short Circuit Current for one second.} \\ I_t = \text{Short Circuit Current for } t \text{ seconds.} \\ t = \text{Duration in seconds.} \end{array}$$

Maximum Conductor temperature during short circuit is 160°C for both G. P. PVC & H. R. PVC Cables.

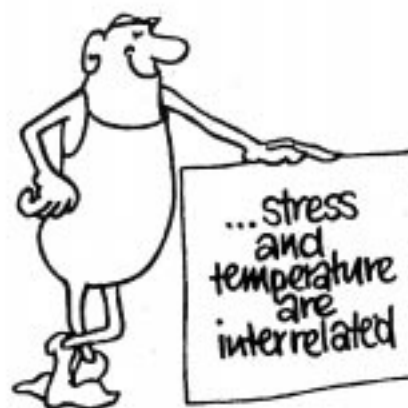
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CURRENT RATINGS

The current ratings given in tables I to III are based on normal conditions of installation described below.

1.	Maximum conductor Temperature	70 ⁰ C for GPPVC Insulation. & 85 ⁰ C for HRPVC Insulation.
2.	Thermal Resistivity of Soil.	150 ⁰ C cm/w.
3.	Thermal Resistivity of PVC.	650 ⁰ C cm/w.
4.	Ground temperature.	30 ⁰ C.
5.	Ambient Air Temperature.	40 ⁰ C.
6.	Depth of laying.	75 cms.

Cables shall only be operated at their full rating if the minimum current at which circuit protection is designed to operate does not exceed 1.5 times (in case of cables in air or in ducts.) or 1.3 times (in the case of cables laid direct in the ground) the values tabulated in tables I to III.

NOTE :

For cables in air no reduction in current ratings is necessary provided that :

1. The horizontal clearance between circuit is not less than six times the overall diameter of an individual cable. Not less than the overall width of individual circuit, except the horizontal clearance in any case need not exceed 150mm.
2. The vertical clearance between circuits is not less than 150 mm.
3. If the number of circuits exceeds 4, they are installed in a horizontal plane.

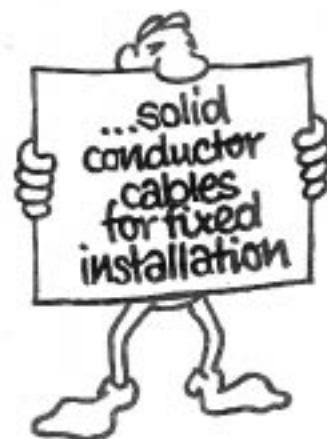
However; for installation conditions other than above, current rating factors incorporated in IS-3961 Part II may apply.

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CURRENT RATINGS :

TABLE I : 1.5 sq. mm., Solid Copper Conductor, PVC Insulated, PVC Sheathed, Unarmoured (YY)/Armoured (YWY & YFY) Multi Core Control Cables - 650 /1100 Volts

No. of Cores	Nom. Thickness of PVC Insulation in mm	Minimum Thickness of Inner Sheath in mm	Unarmoured		Armoured			Max. DC conductor Resistance at 20°C ohm/km	AC Current ratings	
			Approx. Overall Dia. mm	Approx. Net Weight kg/km	Nom steel Armour size in mm W F	Approx Overall Dia mm.	Approx Net Weight kg/km		In Ground Amps.	In air Amps
2	0.8	0.3	10.5	137	1.40	13.8	371	12.1	23	20
3	0.8	0.3	11.0	160	1.40	14.0	406	12.1	21	17
4	0.8	0.3	11.85	189	1.40	15.0	416	12.1	21	17
5	0.8	0.3	12.80	224	1.40	15.7	550	12.1	16	14
6	0.8	0.3	13.60	259	1.40	16.6	580	12.1	15	13
7	0.8	0.3	13.60	271	1.40	16.6	593	12.1	14	13
8	0.8	0.3	15.60	293	1.40	17.65	641	12.1	14	13
9	0.8	0.3	16.00	340	1.40	18.7	680	12.1	13	11
10	0.8	0.3	16.50	373	1.40	20.0	800	12.1	13	11
12	0.8	0.3	17.30	439	4 x0.8	20.2	858	12.1	12	10
14	0.8	0.3	18.00	481	4 x0.8	20.9	796	12.1	11	10
16	0.8	0.3	19.00	554	4 x0.8	21.6	880	12.1	11	9
19	0.8	0.3	20.30	609	4 x0.8	22.5	935	12.1	10	9
24	0.8	0.3	23.30	758	4 x0.8	25.4	1162	12.1	9	8
27	0.8	0.3	23.80	820	4 x0.8	25.8	1240	12.1	9	8
30	0.8	0.3	24.60	896	4 x0.8	26.6	1327	12.1	9	7
37	0.8	0.3	26.20	1071	4 x0.8	29.0	1527	12.1	8	7
44	0.8	0.3	30.0	1150	4 x0.8	31.0	1650	12.1	7	6
52	0.8	0.4	32.0	1360	4 x0.8	33.0	1800	12.1	7	6
61	0.8	0.4	34.0	1680	4 x0.8	34.5	2250	12.1	6	6

* Cables with stranded conductor can be made on request.

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CURRENT RATINGS :

TABLE II : 2.5 Sq. mm., Solid Copper Conductor, PVC Insulated, PVC Sheathed, Unarmoured (YY)/Armoured (YWY & YFY), Multi Core Control Cables-650/1100 Volts

No. of Cores	Nom. Thickness of PVC Insulation in mm	Minimum Thickness of Inner Sheath in mm	Unarmoured		Armoured			Max. DC conductor Resistance at 20°C ohm/km	AC Current ratings	
			Approx. Overall Dia. mm	Approx. Net Weight kg/km	Nom steel Armour size in mm W F	Approx Overall Dia mm.	Approx Net Weight kg/km		In Ground Amps.	In air Amps
2	0.9	0.3	11.75	180	1.40	14.8	452	7.41	32	27
3	0.9	0.3	12.35	215	1.40	15.5	499	7.41	27	24
4	0.9	0.3	13.30	260	1.40	16.4	571	7.41	27	24
5	0.9	0.3	14.5	305	1.40	17.4	690	7.41	23	19
6	0.9	0.3	15.50	360	1.40	18.5	732	7.41	21	18
7	0.9	0.3	15.50	380	1.40	18.5	752	7.41	20	17
8	0.9	0.3	16.75	432	4 x0.8	19.55	829	7.41	19	16
9	0.9	0.3	18.50	490	4 x0.8	20.2	850	7.41	19	16
10	0.9	0.3	19.20	530	4 x0.8	21.9	876	7.41	18	15
12	0.9	0.3	20.30	610	4 x0.8	22.3	952	7.41	17	14
14	0.9	0.3	21.20	690	4 x0.8	24.0	1061	7.41	16	13
16	0.9	0.3	22.30	770	4 x0.8	25.0	1172	7.41	15	13
19	0.9	0.3	23.35	875	4 x0.8	26.0	1283	7.41	14	12
24	0.9	0.3	26.70	1090	4 x0.8	30.0	1556	7.41	13	11
27	0.9	0.4	27.50	1190	4 x0.8	30.5	1680	7.41	12	10
30	0.9	0.4	28.50	1310	4 x0.8	31.5	1857	7.41	12	10
37	0.9	0.4	31.30	1610	4 x0.8	34.0	2138	7.41	11	9
44	0.9	0.4	34.0	1960	4 x0.8	36.5	2500	7.41	10	9
52	0.9	0.4	37.0	2300	4 x0.8	38.5	2900	7.41	10	8
61	0.9	0.4	39.5	2600	4 x0.8	40.0	3300	7.41	9	8

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CURRENT RATINGS :

TABLE III : 2 Core, 3 Core, & 4 Core Copper Conductor, PVC Insulated, PVC Sheathed, Unarmoured (YY) Armoured (YWY & YFY) Cables - 650 / 1100 Volts

No. of Cores	Nom. cross sectional Area sq. mm	Nom. Thickness of PVC Insulation in mm	Minimum Thickness of inner sheath in mm	Unarmoured		Armoured			Max. DC conductor Resistance at 20°C ohm/mk	AC Current ratings	
				Approx. Overall Dia mm	Approx Net Weight kg/km.	Nom steel Armour size in mm W F	Approx Overall Dia. mm.	Approx Net Weight kg/km		In Ground Amps.	In air Amps
2	4.00	1.0	0.3	13.3	260	1.4	16.3	590	4.16	41	35
2	6.00	1.0	0.3	14.3	325	1.4	17.2	690	3.08	50	45
2	10.00	1.0	0.3	16.0	440	1.4	19.0	860	1.83	70	60
2	16.00	1.0	0.3	19.5	660	4 x 0.8	21.0	1000	1.15	90	78
3	4.00	1.0	0.3	14.0	310	1.4	16.9	670	4.61	36	30
3	6.00	1.0	0.3	15.2	395	1.4	18.0	775	3.08	45	39
3	10.00	1.0	0.3	17.0	540	4 x 0.8	20.1	1020	1.83	60	52
3	16.00	1.0	0.3	20.6	820	4 x 0.8	22.3	1190	1.15	77	66
4	4.00	1.0	0.3	15.0	370	1.4	18.1	760	4.61	36	30
4	6.00	1.0	0.3	16.5	485	4 x 0.8	19.4	920	3.08	45	39
4	10.00	1.0	0.3	18.5	675	4 x 0.8	20.8	1110	1.83	60	52
4	16.00	1.0	0.3	22.7	1030	4 x 0.8	24.4	1435	1.15	77	66

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RECOMMENDATIONS FOR STORAGE & INSTALLATION OF CABLES

For easy and convenient installation conditions and desired performance, following recommendations are made :

- i) No drums should be stored one above the other.
- ii) Drums should be stored preferably on a plain ground without having any projected hard stones above the ground surface. The drums should be stored preferably in the shed.
- iii) Drums should be stored and kept in such a way that bottom cable end does not get damaged.
- iv) Drums should be rotated only in the direction mark on the drum.
- v) While laying the cable in a trench the cable end should be pulled with pulling eye only after mounting the drum on the jacks.
- vi) 100% drums shall be checked for continuity and cross continuity tests to ensure that there is no internal damage to cable during transportation.
- vii) Insulation resistance shall be measured with 500 V. megger between the cores and all the cores to earth (Armour).
- viii) After the cable is installed, before commissioning it shall be tested for high DC voltage test. The recommended volts and duration of the test between each core and metallic armour (earth) at 3 KVDC is for 5 minutes. During High Voltage test all the electrical equipments related to the cable installation must be earthed and adequate clearance should be maintained from the other equipments and from work to prevent flash over.
- ix) Where the cable is to be joined with an existing cable, the sequence of cores at the two ends to be joined should be in the opposite direction i.e. if at one end it is in the clockwise direction at the other end it should be in the anti-clockwise direction. This is necessary to avoid the crossing of cores while joining. This will also decide the direction in which the cable is to be pulled.
- x) The minimum bending radius for cable should not be less than the values shown below. Wherever possible 25% higher value should be adopted.
8 x overall diameter : Single core as per table I
12 x overall diameter : Multicore as per table II, III
- xi) Avoid excessively high temperature when sealing joints of cable. Cool the sealant to about 100°C before pouring.

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